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THE KENT INCORPORATED SOCIETY
FOR PROMOTING EXPERIMENTS IN
HORTICULTURE

SUPPLEMENTARY
ANNUAL REPORT

(TWENTY-SECOND YEAR)

GENERAL DEVELOPMENT AND ACTIVITIES

EAST MALLING
RESEARCH STATION
EAST MALLING
KENT

1st January, 1934 to 31st December, 1934

Published May, 1935

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H. WORMALD, D.Sc. (Lond.), A.R.C.S., D.I.C.

STAFF

Director: RONALD G. HATTON, C.B.E., M.A. (Oxon), V.M.H.

Assistant Director: R. C. KNIGHT, D.Sc.(Lond.), D.I.C. (Deceased Jan. 1935.)

Technical Officer: N. B. BAGENAL, B.A.(Cantab.).

Pomology: R. G. HATTON,* C.B.E., M.A. (Oxon), V.M.H.
N. H. GRUBB, M.S.A. (Cornell).
W. S. ROGERS, M.A., Dip. Hort.(Cantab.).
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A. W. WITT, N.D.H., *Consultant Propagator.*
H. M. TYDEMAN, *Plant Breeding.*
A. C. PAINTER, *Assessor of Market Qualities.*
F. H. BEARD, Hort. Dip.(Wye), *Hops.*
W. A. BANE, B.Sc.Hort.(Reading), *Soil Survey.*
D. H. HAMMOND, *Assistant Propagator.*
Miss A. B. BEAKBANE, B.Sc.Hort. (Lond.), N.D.H.
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Statistics: T. N. HOBLYN, Hort. Dip.(Wye).
Miss J. L. EDGAR, B.Sc. (Lond.).
Lab. Assistant: Miss J. S. PLACKETT.

Plant Physiology: R. C. KNIGHT,* D.Sc. (Lond.), D.I.C., of the Imperial College of Science and Technology. (Deceased Jan. 1935.)
M. C. VYVYAN, M.A.(Cantab.).
Lab. Assistant: P. HILLS.

Bio-Chemistry: W. A. ROACH,* B.Sc.(Lond.), A.R.C.S., D.I.C., A.I.C.
Lab. Assistant: R. CORNFORD.

Mycology and Bacteriology: H. WORMALD,* D.Sc.(Lond.), A.R.C.S., D.I.C.
R. V. HARRIS, B.Sc.(Lond.), A.R.C.S., D.I.C.
Miss I. LAUDER-THOMSON, B.Sc., *Special Assistant, Strawberry Work.*
Miss J. B. HAMOND, Ph.D., B.Sc.(Lond.), *Walnut Propagation and Diseases.* (Retired May 1934.)
Lab. Assistant: Miss K. CORNFORD.

Entomology: A. M. MASSEE,* F.R.E.S.
R. M. GREENSLADE, B.Sc., A.R.C.S.
Lab. Assistants: R. G. GAMBRILL.
M. I. KING.

Insecticides and Fungicides:

Chemistry: H. SHAW, M.Sc.Tech., Ph.D.
Lab. Assistant: R. N. PIERCE.

Entomology: W. STEER, B.A.(Cantab.).
F. J. D. THOMAS, B.Sc., A.R.C.S., *Special Assistant.*

Mycology: M. H. MOORE, Dip. Hort. Sci.(Reading).
H. B. S. MONTGOMERY, B.A., *Special Assistant.*

* Recognized teacher of the University of London, for purposes of Higher Degrees.

Guide Demonstrator and Exhibitions Officer: H. C. CHAPELOW, Meteorological Records.

Advisory Officer in Commercial Fruit Growing to the Kent County Council stationed at East Malling, Kent: W. G. KENT, N.D.H.

ADMINISTRATION.

Secretary: C. T. ROYLE.

Book-keeper: P. R. WOOD.

Director's Personal Secretary: Miss L. E. ALEXANDER.

Clerical Staff: Miss I. M. FISHER, Miss M. E. DAY, Miss E. M. LAWSON, Miss J. M. COY, Miss J. BURGESS, and Miss J. CRAYFORD.

VISITORS.

Visits may be paid to the Research Station on any week day *by appointment* (Saturday afternoon under exceptional circumstances only).

Passenger Station: East Malling Halt (Southern Railway).

Goods Station: Aylesford (Southern Railway).

Bus Services:

FROM MAIDSTONE by the Maidstone and District Motor Services Limited, every 20 minutes from Maidstone to East Malling Church.

FROM LONDON a regular service of Maidstone and District Coaches from the London Coastal Service Limited, Victoria Station, may be of assistance to Visitors. The Coaches call at East Malling on certain inward and outward journeys.

For Visitors coming by road DITTON CORNER on the main London-Maidstone Road (with Red Lamp Danger Signal) is the turning to the Research Station.

Telephone: Aylesford 7229.

Telegrams: Research, East Malling.

THE IMPERIAL BUREAU OF FRUIT PRODUCTION

is accommodated at East Malling Research Station.

STAFF.

Director: R. G. HATTON, C.B.E., M.A. (Oxon), V.M.H.

Chief Officer: D. AKENHEAD, M.A. (Oxon), B.Sc.Agric. (Lond.).

Assistant: G. St. C. FEILDEN, B.A. (Oxon).

Secretary: Miss R. M. ALLISTON.

Shorthand-Typists: Miss F. H. WHITEHEAD, and Miss M. B. ROGERS.

Telephone: Aylesford 7188.

GENERAL DEVELOPMENT AND ACTIVITIES

EDITORIAL.

When we come to read the record of the expansion of the Station's activities during 1934, we begin to appreciate more fully the very material help which His Royal Highness the Duke of York gave to our work by honouring us with a visit. This official recognition of the importance of horticultural research was vividly reflected in the rapid development of our Associate Membership Scheme and in the successful establishment of our 21st Birthday Fund for Development, both of which funds have assisted very materially in the considered development of our work. The Associate Membership Scheme has handsomely supplemented our salary and maintenance expenses, and the 21st Birthday Fund has enabled us to equip the experimental farm with the long needed packing and storage facilities.

The recognition of East Malling's development under the auspices of the Empire Marketing Board as an essential part of the normal expansion of its activities, and the further material support offered by the growers, have both contributed towards a feeling of stability and security which had been sadly lacking in recent years.

Not only did the staff enter wholeheartedly into the exceptional effort demanded by our 21st Anniversary celebrations, facing cheerfully the resulting influx of visitors and the additional calls upon their time for propaganda work which this inevitably entailed, but in the year they actually published a record number of scientific and popular reports. At the moment then when we were all contemplating a period of more undisturbed research, and had settled down to the revision and long distance planning of the research programme with a new confidence, the loss of Dr. Knight who had long been a leader in such planning, came as a severe blow to the Station, and we have to face the new year with the most difficult problem of filling the gap.

The research staff have widened their activities and developed their team work most profitably in several directions—notably in relation to strawberry problems in Kent, and to the ever pressing demand for the speeding up of Disease and Pest Control measures. At the same time, the year's records show that with regard to advisory and educational work every effort has been made to meet the increasing demands of our members, and our promises to our own County in this respect.

The attendance at the periodical demonstrations on the Station shows that these are appreciated, and they have certainly proved a stimulus to further visits and enquiries.

The acreage of available land for the development of further urgent field investigations upon the Station is now practically exhausted. Were it not for the fact that our considerable area of layer beds of clonal rootstocks true to name has been declared to be an asset to our national Horticulture, we should from an experimental point of view, have welcomed a drastic curtailment of these admittedly valuable but increasing commitments. On the other hand, it should be pointed out that the Sales of Produce from the Experimental Farm, which includes these stock beds, have for the past two years gone a considerable way towards meeting the very heavy wage and general expense charges which are inevitable where farm operations have to be brought into close relationship

with detailed experimental requirements. At present, therefore, the balance of argument would seem to be against the policy of drastic grubbing of areas of historic or commercial value.

COMMITTEES.

Mr. James Stenhouse retired on the completion of his term of office as President of the Institute of Brewing and Mr. Christopher George is welcomed in his place. No other changes in the personnel of either the Appointed Members or the Executive Committee have to be reported.

Dr. Wormald was re-elected Staff Representative for the year at the Staff Council in May.

The Executive Committee met four times during the year.

The Fourteenth Annual General Meeting and Members' Day was held on 24th May, full details of which appear elsewhere in the report. Thanks are specially due to the 21st Anniversary Sub-Committee for the work entailed in the arrangements for the reception of H.R.H. the Duke of York and to Lord Cornwallis in particular for his invaluable guidance in matters of procedure.

The Executive Committee re-elected Mr. P. Manwaring as Chairman for the ensuing year, with Mr. S. W. Mount Vice-Chairman, and Mr. T. Neame Chairman of Finance.

The work of the Sub-Committees has been heavy, eighteen meetings being held—five more than in 1933. The erection of the new Packing Shed and Cold Storage equipment has been completed, and thanks are due to the Finance and Building Sub-Committees (Chairman, Mr. W. T. Edmonds) who dealt with this matter. The Sub-Committee dealing with the prices for our Rootstock Distribution met under the Chairmanship of Mr. W. T. Edmonds, and the Hop Sub-Committee held their Annual Meeting at the end of August (Chairman, Mr. J. D. Maxted). The Fruit Sub-Committee (Chairman, Mr. C. S. Smith) met both in July and August to go through the experimental plots and fruit programme very thoroughly. It passed a resolution urging the Executive Committee to make land available for the further development of the rootstock work along lines which would afford growers accurate information re costings, etc. This matter is being investigated by the Executive Committee.

The Post-Graduate Sub-Committee under the Chairmanship of Professor V. H. Blackman met in October last to review the position of graduate workers; the main subject of discussion was the difficulty of obtaining long period students owing to the lack of any Scholarship Funds. It is a pleasure to report that Mr. E. M. H. Lloyd has consented to remain on this Committee in a personal capacity.

THE ANNUAL GENERAL MEETING AND ASSOCIATE MEMBERS' DAY.

On 24th May, 1934, East Malling Research Station celebrated its 21st Anniversary in glorious weather and in the presence of a large and distinguished company. Owing to the number of members attending we were glad to accept the offer of the loan of the large packing shed at Ditton Laboratory for the holding of the Fourteenth Ordinary General Meeting of the Society. Mr. P. Manwaring took the chair and presented the Twenty-first Supplementary Annual Report (1933) and the Balance Sheet for the year ended 30th September, 1933, and these were approved.

The Eighth Annual Meeting of Associate Members which followed was made all the more memorable by the presence of His Royal Highness the Duke of York, K.G. who attended by his equerry, the Hon. T. Coke, arrived shortly before 12.45 p.m. and was received by the Lord Lieutenant of Kent, the Marquis Camden, who presented to him

the High Sheriff of Kent, Mr. A. C. Davis, the Minister of Agriculture, the Rt. Hon. W. E. Elliot, P.C., the Chairman, Mr. P. Manwaring, the Director, Mr. R. G. Hatton and the Chairman of the Kent County Council, Alderman F. W. Payne. On entering the Staff Room His Royal Highness shook hands with the Rt. Hon. Lord Cornwallis, the Under Sheriff, Mr. W. H. Whitehead, the Chief Constable of Kent, Major H. E. Chapman, Sir C. J. Howell-Thomas, Permanent Secretary of the Ministry of Agriculture, Mr. H. V. Taylor, Horticultural Commissioner, Ministry of Agriculture, and with each member of the Executive Committee. He then unveiled a small portrait gallery consisting of signed photographs of men who have played an important part in the history of the Research Station.

Luncheon followed in the newly erected Packing Shed where over 600 members and guests were assembled to greet the Royal Visitor with " Kentish Fire ". Space will not allow the mention by name of the many distinguished guests including representatives from the University of London, the Agricultural Research Council, N.F.U. Headquarters and County Branches, the County Councils of Kent, East and West Sussex, and the Worshipful Company of Fruiterers.

Following the loyal toast, Mr. Percy Manwaring proposed the toast of the Royal Family and welcomed the Duke of York to the Research Station. His Royal Highness proposing the toast of East Malling Research Station compared it to a standard fruit tree established in good soil under ideal conditions, a tree which took some years to come into bearing for scientific work, but which once in bearing would continue to flourish and yield excellent fruit.

The Rt. Hon. W. E. Elliot, Minister of Agriculture, who responded, described the visit of His Royal Highness as one of the greatest honours which could be paid, not merely to East Malling, but to the whole group of horticultural research workers who were doing so much for the interests of agriculture in this country. The Chairman who also responded said the three essentials to success in agriculture were intensive research, better marketing and security of price. At the conclusion of the after-luncheon speeches, the Vice-Chairman, Mr. S. W. Mount, asked the Duke of York to accept a bound copy of the Annual Report and list of subscribers.

After luncheon Mr. Hatton conducted the Royal Visitor round the laboratories and plantations to inspect a series of exhibits which had been arranged to illustrate the principal features in the work of the Station during the last twenty-one years. Beginning with the Pomology laboratory, the Duke was shown an exhibit illustrating the importance of the fruit soil survey work carried out by Mr. W. A. Bane in collaboration with Mr. B. S. Furneaux of Wye College. Boxes containing soil monoliths of typical soil series from the survey area which had been prepared by Mr. Furneaux and loaned by Wye College, and photographs of fruit trees of the same age on these different soils demonstrated the close connection which the survey work had shown to exist between soil-texture, drainage and tree growth, and served to illustrate the practical importance of such work to fruit growers in Kent.

In the Pomology laboratory Mr. Hoblyn showed the Duke an exhibit of coloured photographs showing the effect of different methods of manuring upon the foliage and fruit of apple trees in illustration of the importance of giving the trees a " balanced ration " of plant foods. Passing across to the Manwaring Building the Royal Visitor was shown the famous excavated apple tree hanging from the roof with its roots carefully arranged in the position they formerly occupied in the soil. In the Entomology laboratory Mr. Massee exhibited large-scale waxwork models of some notorious insect pests which had been specially constructed for the occasion, whilst next door a comprehensive exhibit had been staged to illustrate the combined investigations of the team of research

workers who are battling with the many strawberry problems which beset the modern grower.

Leaving the laboratories His Royal Highness proceeded on his way to Great East Plantation. Here he inspected Miss Hamond's exhibit dealing with the various aspects of her work on how to produce bigger and better British walnuts; here too Mr. Tydeman explained his technique for producing new apple seedlings which it is hoped will prove immune to Woolly Aphis. Next Mr. Roach explained his experiments in connection with the injection of fruit trees, the tree being made to feed itself from bottles through rubber tubes inserted into the branches. Passing on through the plantations, Mr. Hatton pointed out the enormous differences in the size of various fruit trees of the same age and explained to the Duke the part which rootstock influence played in the planning and planting of up-to-date orchards. Descending into an underground observation trench His Royal Highness saw through glass windows the method by which Mr. Rogers studies the roots of an apple tree actually growing in the soil.

The tour ended with a visit to the cordon plantation after which the Royal party returned to Kiln Field where the members and guests had gathered to see General Sir Ivor Maxse and Sir Bernard Greenwell, trustees of the Endowment Fund, present to the Duke the lease of the 18 acre plantation which had recently been purchased through the Fund. His Royal Highness handed over the lease to Mr. Percy Manwaring as Chairman of the Research Station and proceeded to inaugurate the post-blossom spraying programme in the newly acquired plantation. Mr. Moore and Mr. Bates were waiting at the Spraying Machine, and at a given signal His Royal Highness started the engine.

Before finally taking his departure, the Duke of York accepted from Miss Margaret Amos, daughter of Mr. Jesse Amos, two baskets of a selected strawberry and a new raspberry seedling raised at East Malling as a present for Their Royal Highnesses the Princess Elizabeth and the Princess Margaret Rose.

His Royal Highness was given a rousing send-off by the assembled company who then proceeded to inspect the twenty-four separate exhibits which had been staged in field and laboratory. Not the least interesting of these was the experimental strawberry plot in Egham Field consisting of a number of Royal Sovereign plants, the progeny of three single parents; other features of interest were some trees of Stirling Castle apple which had been top-grafted to Worcester Pearmain by the new methods of " porcupine " and " side "-grafting and which, in their second season from grafting, were already yielding fruit. The large apple manurial trial in Church Fields provoked much interested comment on the part of fruitgrowers from all over the country on account of the very marked differences which could be seen in the six year old trees of Cox and Beauty of Bath which were undergoing eight distinct manurial treatments.

Tea was partaken in the Packing Shed and not the least satisfactory part of the day's proceedings was the fact that at seven in the evening small parties of fruitgrowers were still to be seen in animated discussion scattered about in different parts of the experimental plantations.

Thus ended a red-letter day in the history of the Research Station and one which will be long remembered for the gracious enthusiasm shown not only by His Royal Highness the Duke of York but by all the large company who assembled to celebrate the 21st Anniversary of East Malling.

Our thanks are specially due to the Kent Rural Community Council for the loan of flags and bunting, Messrs. Fremlin Bros., Ltd., and Messrs. Style & Winch, Ltd., for most generously supplying the bottled beer, and to Superintendent Ingram of the County Police, and Inspector Ponsford of the Automobile Association for the services they rendered.

FINANCE.

A general statement for the Financial Year 1st October, 1933 to 30th September, 1934, covering the main items of income and expenditure, is appended herewith.

It will be noted that the " A " Account shows the expenditure of £1,658 15s. on the erection of the new Packing Shed—the Ministry having agreed that this amount should be a Farm charge and approved an overdraft until such time as the Farm could repay.

The Bank overdraft at 30th September, 1934 (including the Packing Shed cost) was £4,075 16s. 1d. against the figure of £2,667 12s. 3d. at 30th September, 1933.

Sales of produce were fairly satisfactory with a total of over £7,100, and while this is invariably a very fluctuating figure especially on a Research Farm, it is anticipated that from this source we shall be able slowly to clear off the cost of the new shed. The increased accommodation for grading, packing and storing fruit should have beneficial results upon these figures.

Grants from the County Councils of Kent, East Sussex and West Sussex through their Education Committees have been continued, together with the general grants in aid of research by The Imperial Chemical Industries, Ltd., and The United Potash Co., Ltd. The Committee are grateful for this continued assistance and wish to record their thanks for these grants.

It will be recollected that our last report dealt with the uncertain position of the old Empire Marketing Board Grant and the possibility of a deputation to the Ministry of Agriculture. It is pleasing to record that such a deputation has not been necessary and in May 1934 it was intimated that the Ministry were prepared to continue the old Empire Marketing Board Grant from the Development Fund until September 1934 with a possible continuance on a similar basis to the " A " Grant. At the time of going to press, we have been given unofficially to understand that we may hope for this amalgamation as from 1st April, 1935. Meanwhile grants are being maintained direct through the Ministry of Agriculture.

Negotiations have taken place during the year with the Agricultural Research Council regarding the acceleration of investigations on Insecticides and Fungicides and the resulting Pest Control. The Agricultural Research Council invited the Station to outline a scheme for the development of such work and, after approving it, offered under certain conditions, a grant not exceeding £1,225 over an initial period of 15 months from July 1934 for these investigations. A chemist to deal with the problems of spray fluids has been added to the Staff. Alterations to buildings have been necessary to provide the accommodation needed by the augmented team.

This development enables the Station to test out a far wider range of new substances for disease control work. The Imperial Chemical Industries, Ltd., through its Research Committee, have also provided a special grant under the terms approved by the Ministry of Agriculture, for assisting this work.

The special grants from the Agricultural Research Council, Messrs. Cooper MacDougall & Robertson Ltd., and the Kent Branch of the National Farmers' Union for pursuing investigations into the Control of Loganberry Beetle and the use of Derris as an insecticide terminated in September. Once again our thanks are due to these bodies for making it possible to complete this piece of work. The National Farmers' Union voted the small balance over from their fund to assisting the development of the Strawberry Rootrot work initiated by Dr. Berkeley.

The special Ministry of Agriculture grant for Investigation of Walnut culture having ceased in September 1933, we are indeed grateful to the Royal Horticultural

Society for this year offering a grant of £50 to enable an effort to be made to complete the work.

Finance.

General Income and Expenditure Details.

"A" Account—Research and Maintenance Grants through the Development Fund, and other Sources from 1st October, 1933 to 30th September, 1934.

Income.	£	s.	d.
Grant from Ministry of Agriculture	8,395	19	6
Other Grants and Contributions (General)	903	8	9
Miscellaneous	53	1	5
Sales of Produce	4,927	11	0
Balance *added* to Overdraft during year	1,311	6	4
	£15,591	7	0

Expenditure.	£	s.	d.
Research and Administrative :			
Salaries and Superannuation	5,755	8	11
General Maintenance	1,498	12	9
Experimental Farm :			
Wages	4,484	17	2
New Packing Shed and Equipment	1,658	15	0
General Farm Expenses	2,193	13	2
	£15,591	7	0

"B" Account—Research and Maintenance Grants through the Development Fund (formerly Empire Marketing Board Fund) from 1st October, 1933 to 30th September, 1934.

Income.	£	s.	d.
Balance unexpended at 30th September, 1933	411	15	10
Grant from Ministry	6,621	12	5
Special Grant—Interchange Worker	203	16	9
Sales of Produce	2,179	14	11
Miscellaneous	55	0	0
	£9,471	19	11

Expenditure.	£	s.	d.
Research and Administrative :			
Salaries and Superannuation	4,828	4	6
General Maintenance	1,615	1	6
Expenses of Interchange Worker	203	16	9
Experimental Farm :			
Wages	1,707	19	2
General Farm Expenses	972	15	10
Balance	144	2	2
	£9,471	19	11

Membership Scheme.

The year opened with a membership of 785, and on 31st December a figure of 1,117 had been reached, making an increase of 332 members. During the last few weeks of the year 21 new members applied for registration as from 1st January, 1935, making a total on 1st January of 1,138.

An endeavour was made to double our membership and although this has not quite been accomplished we are indeed grateful for the splendid help and interest shown by so many members, who have so willingly given their time and thought to promoting interest in the work at East Malling.

When the growth of the Station over the last twenty-one years is reviewed, it is appreciated how much the Station owes to its members who on more than one occasion have so willingly and generously added a little more help to enable the work to advance.

Subscriptions paid during the year amounted to £1,103 4 3

Donations and Life Members' Subscriptions £250 7 0

In addition to the general expenses of the Membership Scheme, including part of the cost of the Annual Report, amounting to approximately £500 per annum, this fund is now making a contribution of approximately £445 per annum towards the salaries of Research and Administrative Staff. Thus £945 of the annual income is used for definite purposes and the Station is being pressed to undertake further work if funds permit. To meet these needs it is hoped that the efforts still being made to increase the Membership Fund will be successful. From the balance of the Membership Fund brought forward from 1933 (£1,437) a capital grant of up to £350 has been made towards the building and equipment of the new photographic studio and dark room and finally the same fund has been able to provide a loan of all the working capital necessary (approximately £600) for the first year's outgoings on the newly acquired Kiln Field.

It is hoped that the authorities will be favourably impressed by the practical support growers are giving towards our pressing needs.

The Spray Calendar issued in December 1933 has been appreciated and over 200 copies have been sold to non-members. A few copies are still available for which a charge of 5s. each post free is now made.

The distribution of surplus stocks has been much appreciated by our members and it has been found difficult to meet all the demands.

Members are reminded that all requests for surplus material must be received prior to the closing date in October. Disappointment is often caused through orders not being received until after the closing date when allotments have already been made.

Development and Endowment Fund.

The investment, as reported last year, of the original Endowment Fund in the purchase of Kiln Field, some 18 acres of established fruit, has already proved of great value to the Station for the development of its Insecticide and Fungicide work. The decision of the Committee also to place the 21st Anniversary Fund in the hands of the trustees has made a further sum available for Capital purposes and a Trust Deed has been drawn up effecting this.

Special thanks are due to our Chairman for the work involved in sending out this 21st Anniversary Appeal, as a result of which a sum of £1,867 has been raised. In addition, some £60 has been promised annually for a period of seven years.

During the Summer the Trustees agreed to loan out of this Fund a sum up to £1,500 for the installation of the Cold Store Equipment—the loan to bear interest and to be repayable over a period of ten years.

The great help which a fund of this kind, available for special needs, is to the Station will be readily appreciated. The assistance the Trustees have given in the matter is gratefully acknowledged.

Land and Buildings.

The erection of the new Packing Shed and the installation of the Cold and Gas Storage Chambers has been of special interest to many members.

The Packing Shed is a corrugated iron building 60 ft. long by 80 ft. wide by 19 ft. 3 in. high from ground floor level to eaves, the roof trusses having an 80 ft. span. The roof (except where glazed) is covered with corrugated asbestos cement sheeting. It has made a building of good proportions and in no way offensive to the eye. There is a timber floor over an area 30 ft. by 80 ft. with staircase situated at one end providing

accommodation for making boxes and storing general packing materials. A small platform is provided to give facilities for loading and unloading stores. It was erected by Messrs. Boulton & Paul, Ltd., Norwich.

Messrs. J. & E. Hall, Ltd., Dartford, installed three Cold and Gas Store Chambers (each approximately 2,000 bushel capacity). The three chambers, each 18 ft. by 18 ft. by 16 ft., are timbered, framed and boarded and lined with zinc sheeting. The refrigerating plant is an automatic one, made up of compressor motor and condenser, and this unit is situated on the chamber top, with a circular type of fruit cooler in the centre of each room, with reversible electric fan. The chambers are complete with control switches and the CO_2 sampling apparatus and thermometers (long distance), with specially constructed tray mats in the chambers for ensuring good circulation.

An Insectary, for the artificial rearing of insects for laboratory tests, has been built for the Entomologists, consisting of a small wooden structure 10 ft. by 6 ft. with large wire gauze windows.

It was found possible, by converting the original Dark Room and Studio, to provide accommodation between the Mycology and Entomology Sections for the Pest Control team and so keep the workers together and in close touch with the chemist. This made it necessary to provide fresh accommodation for Photography and a new Studio and Dark Room—a small brick building 18 ft. by 19 ft. has been added to the west end of the Manwaring Building.

Messrs. Kodak Ltd. provided up-to-date plans to meet modern requirements and the building comprises Developing Room, Printing and Enlarging Room and a Studio 18 ft. by 9 ft. The equipment includes flood lights and a special camera stand which greatly facilitates the illumination and photography of small objects, such as fruit, plants, etc. This building has already proved of immense value to the Station.

The Trustees having acquired the Kiln Field land, it was found possible to widen the entrance and approach road to the Station from the Ditton Parish road. This much needed improvement is of special value when meetings are held. Members may recollect the very great difficulty of getting to and from the Station by the old narrow road. The road at the entrance to the farm has been made up as far as the new Packing Shed, some 50 yards, and it has been possible to install electric lighting into the Farm Buildings.

The Pathology Greenhouse has been fitted with eight special electric lamps, each 1,000 watt, for providing additional illumination to supplement daylight, the lighting being controlled for definite periods by means of time switches. This was needed to enable the virus work to carry on during the winter months.

Staff.

The Station as a whole and many of the Staff individually have suffered a severe blow through the death of our Assistant Director, Dr. R. C. Knight, as a result of a return of his old illness in December. He collapsed, after a severe operation, on 28th January, 1935. An appreciation of his wonderful work for the Station and Horticultural Science is embodied in the Annual Report, but in opening our record with this sad news we must refer to his untiring energy, sympathy and wise counsels which have left their indelible mark on our Institute and which so many of the Staff will never forget. The Station can ill afford his loss at a time in its development when his ability and inspiration would have proved especially invaluable.

We accord a hearty welcome to Dr. H. Shaw who came to us in July from the Faculty of Technology, University of Manchester to fill the post of research chemist.

He comes to supply that oft expressed need, the link between the Pathologists and the Chemical problems with which they are constantly faced. We wish him every success in this new field of work at East Malling which has been made possible by the special grant from the Agricultural Research Council.

The development in our Insecticide and Fungicide work for the conduct of which we are closely associating Messrs. W. Steer and M. H. Moore with Dr. Shaw, enabled us to offer Mr. F. J. D. Thomas, who had been doing volunteer work, a temporary special assistant's post in the Entomology Section, whilst Mr. H. B. S. Montgomery came to fill a similar position on the Mycology side. Miss I. Lauder-Thomson, who came to do voluntary work with Dr. Berkeley, has continued the strawberry root rot investigations under a temporary grant. Miss M. E. Renwick joined the Pomological Section in May to assist with the recording work. We wish all these workers success from the good beginnings which have been made.

We were sorry to say " good-bye " to Dr. and Mrs. G. H. Berkeley on their return to St. Catharines, Ontario, but glad that they were able to be with us on our 21st Anniversary—for Dr. Berkeley entered so enthusiastically into many aspects of our various problems. We were glad to welcome back Mr. and Mrs. R. V. Harris in August after their valuable experiences in Canada and the United States.

We were sorry to lose Miss J. B. Hamond, who had developed our Walnut Investigations so thoroughly, on her marriage to Mr. M. H. Moore, of the Mycology Section. We wish them every happiness and are still fortunate in having some assistance from Mrs. Moore in helping to carry on the essentials of the Walnut work with Mr. Witt.

A distinction much appreciated by the Station and Committee was conferred on the Director by H.M. The King at the beginning of the New Year, when he was invested with the insignia of the Order of the Companion of the British Empire.

Messrs. M. I. King, R. Cornford and P. Hills have been appointed to laboratory assistants' vacancies whilst Miss J. Crayford has joined the Administrative Staff. We wish them all success in their work. Oliver Usmar has gone on to the Research Institute in Agricultural Engineering, Oxford, where we wish him every success.

Post-Graduate and Overseas Workers.

Dr. G. H. Berkeley returned to St. Catharines, Ontario, in May and Mr. R. V. Harris arrived back from there in August. As a result of this exchange much useful work has been planned by the two workers concerned.

We congratulate Miss J. B. Hamond on being awarded a Ph.D. of London University in July last for a thesis on " The Morphology, Physiology and Mode of Parasitism of a Species of Chalaropsis Infecting Nursery Walnut Trees ".

Five members of staff and graduate workers are now registered for higher degrees of London University.

During the year eighteen students have visited us under our post-graduate scheme or as voluntary workers for periods of varying lengths; and three of them are still with us.

Miss J. Hearman who came from Australia in December 1933 hopes to prolong her stay for a further period in order to complete her studies of the behaviour of the Northern Spy Rootstock.

We were glad to welcome our first long period graduate worker from South Africa in the person of Mr. A. F. de Wet, Research Officer in Pomology Department at Stellenbosch University, who came in October. Mr. de Wet has been studying our general methods of field experimentation with special attention to propagation and physiology.

We owe a debt of gratitude to Mr. W. J. J. Ferwerda (Dutch East Indies) for a year's very keen voluntary work, and also to Mr. H. Olsen (six months), Mr. H. Christensen (three months) (Denmark), and Mr. H. van den Berg (Holland) for their help as voluntary recorders. Miss B. Wates came in September as a voluntary recorder and has proved a valuable helper to the Pomology Section.

Miss J. Schofield came in October as a voluntary recorder in the Pomology Section and left at the end of November to take up a post at the Cheshire School of Agriculture, Reaseheath. We wish her every success in her new sphere.

Staff Meetings for Research Discussion.

Six Research Discussions were held during the Winter 1933-4. At one meeting Dr. Berkeley described the state of the Strawberry Root Rot investigations in Canada and at East Malling. At the other meetings, reports on various investigations in progress at East Malling were read by members of the teams responsible for them. The meetings were well attended and the discussions lively.

The first meeting of the 1934-5 session was held in December, when the strawberry programme was discussed.

Social Activities.

The chief social activity in 1934 was the holding of a supper party and concert on 22nd January, when to celebrate the 21st year of the Station's life a teak garden seat was presented to Mr. and Mrs. Hatton as a mark of esteem by past and present members of staff. Mr. M. J. R. Dunstan and Captain R. Wellington attended and recalled in their speeches the early days in the history of the Station.

Cricket. Five cricket matches were played during the season, three against local clubs and also Mr. P. Manwaring's XI and the Ditton Laboratory. One game was won, three were lost, and one was drawn. As usual the Manwaring match was played in the rain, but nevertheless some interesting cricket was witnessed. The game was left drawn.

The tennis court was well patronized throughout the Summer. The summer outing was organized with two alternative objectives, one section going to the races at Ascot whilst the remainder went to Margate. Meetings of the Literary and Dramatic Society were well attended.

Collaboration.

Professor E. S. Salmon and Mr. A. H. Burgess of Wye College have continued their work here in the trial of new seedling hop varieties.

Mr. M. B. Crane of the John Innes Horticultural Institution has continued to collaborate in our rootstock breeding work. Consignments of apple rootstocks raised by Mr. Crane and selected at East Malling as resistant to woolly aphis have been sent to Canada, New Zealand, India, Australia, Morocco and Buenos Aires for trial under their conditions.

Mr. D. Boyes of the Horticultural Research Station, Cambridge, has sent us a number of new strawberry seedlings for testing under our conditions.

Mr. W. Steer has continued to collaborate with Dr. F. Tattersfield of the Department of Insecticides and Fungicides at Rothamsted, in a joint piece of biological work on the properties of Derris Root.

In the Mycological Section Mr. Moore has continued his trial of "spreaders" in conjunction with Dr. H. Martin of Long Ashton Research Station.

The mosaic-free raspberry cane nurseries at the County Farm Institutes of Kent, East and West Sussex are now well established under the care of Mr. R. Hart, Mr. G. C. Johnson and Mr. F. W. Costin. A daughter nursery of virus-free clonal selections of Royal Sovereign strawberry has been established at the East Sussex Farm Institute at Plumpton.

As a result of Mr. R. V. Harris's visit to Canada a programme of collaborative work on raspberry and strawberry virus diseases has been planned with the Dominion Laboratory of Plant Pathology, St. Catharines, Ontario.

Especial thanks are due to Dr. Cyril West and Mr. J. K. Hardy for all their advice and help both over the initial plans for our Storage Chamber, and during the first season's running of the plant.

Outside Trials.

The Entomological Section has conducted trials on the control of the Apple Blossom Weevil and of the Apple Sawfly at Rocks Farm, East Malling, and we would again like to express our grateful thanks to Mr. H. B. Weston for providing facilities for the carrying out of these trials.

During the year visits were paid by members of staff to the Rootstock Trial Plots at Swanley and Wisborough Green, and to Mr. Lawrence Taylor's manurial and rootstock trial at Galleywood, Essex.

Mr. Arthur Amos of Spring Grove, Wye, and Mr. Thomas Neame of Macknade, Faversham, have continued to maintain their commercial cane nurseries of mosaic-free Lloyd George raspberry, and we are further indebted to the same two gentlemen for their support in establishing daughter nurseries of our virus-free clonal selections of Royal Sovereign strawberry.

Mr. T. Neame has planted up for us one of the series of experimental pear trees upon different quince and free stocks for which the Station had no ground available.

The Biochemistry Section has carried out trials at the Swanley Horticultural College on the control of chlorosis in peach trees by injection. This was made possible by the courtesy of Dr. K. Barratt, the Principal. Similar experiments were carried out on apple and pear trees in a plantation at Crockenhill with the kind co-operation of Mr. S. Lee. Tree injection experiments were carried out on Rocks Farm with Mr. H. B. Weston's co-operation. The section also co-operated in similar experiments carried out by Mr. Ralling at Brenchley and by Messrs. Foster and Gadsby at Colchester.

Advisory Work.

Correspondence.

A total of 1,754 written replies to enquiries during 1934 represents a slight increase over the previous year in this branch of the Station's activities.

Enquiries from this country included 39 counties in all, Kent heading the list with 515 enquiries, East and West Sussex again coming second with a total of 171, while Essex with 97 and Surrey with 68 came third and fourth on the list. Overseas enquiries totalled 105 apart from those which were referred to the Imperial Bureau of Fruit Production. Telephone enquiries tend to increase every year.

An interesting feature of the advisory work has been the number of enquiries received from schoolmasters in various parts of the country on the subject of planting up school fruit plots.

Visits.

Advisory visits to growers' plantations have been maintained in about the same proportions as last year, the total numbering 184 as against 179 in 1933, of these 116 visits having been to growers in Kent.

Mr. W. G. Kent, Mr. R. Hart, and Mr. B. S. Furneaux have as usual earned our most grateful thanks by their friendly and active collaboration in the matter of advisory visits and in the collection of specimens from growers' plantations. Mr. Kent alone has paid over 400 visits in the year.

Mr. Kent accompanied Mr. Grubb and Mr. Harris when they carried out their annual "roguing" operations on mosaic-free raspberry cane nurseries in Kent. Mr. Grubb and Mr. Harris again visited the cane nurseries in East and West Sussex for the purpose of roguing for mosaic.

Mr. Grubb, Mr. Amos and Mr. Hoblyn accompanied by Mr. B. S. Furneaux of Wye College, made a most interesting three-day tour of fruit farms in Essex and Suffolk to compare the growth of trees on known rootstocks in East Anglia with their performance at East Malling. The thanks of the party are due to Mr. O. G. Dorey of the Essex County Council and to Mr. R. Sayce of the West Suffolk County Council for their friendly co-operation in this visit.

Members of the staff have judged at seven commercial fruit shows during the year, Mr. Amos again judged at the Norfolk Orchard Competition, and Mr. Bagenal judged at the Buckinghamshire Orchard Competition.

LECTURES, DEMONSTRATIONS AND CONFERENCES.

Lectures.

Twenty-one lectures were given by members of the staff during 1934, fifteen of these being under the Ministry of Agriculture Extension Scheme.

Demonstrations.

The policy of extending periodical invitations to growers to visit the Research Station on "open days" in order to familiarize themselves with the findings of our research work in their application to practice has been continued.

During the year four such "open days" were held apart from the annual Members' Day on 24th May. A demonstration in pruning by Mr. Grubb in February was attended by about 150 growers, a demonstration in the grafting of walnuts and in the top grafting of apples was given by Miss Hamond, Mr. Witt and Mr. Garner in April with an attendance of about 250. In July 100 growers came to a "Soft Fruit Day" and in September a "Top Fruit Day" drew an attendance of 150, making a total of 650 for the four demonstrations.

As in other years on numerous occasions demonstrations were given by individual members of the staff to organized parties and to individual visitors in pruning, grafting, grading and packing.

Conferences.

The Director attended a Conference organized by the Royal Horticultural Society at the Crystal Palace in September and read a paper on "Rootstocks for Pears". At this Conference Mr. T. N. Hoblyn opened the discussion on Dr. T. Wallace's paper on

" Orchard Factors Affecting Fruit Quality ". The Director also attended the Growers' Day Conference at the Imperial Fruit Show at Leicester in November organized by *The Fruitgrower*, where he read a paper on " Experiences with Apple Rootstocks at East Malling ".

D1. Wormald attended two meetings of the British Mycological Society and two meetings of the Phytopathological Committee. Five members of the staff attended meetings of the Imperial Mycological Conference in London in September. Members of this Conference visited East Malling on 19th September as recorded elsewhere in this Report.

Mr. Moore contributed to a discussion on Spraying Machinery at a meeting of the Horticultural Education Association at Chelsea in May, and gave an address on Scab control to the Eastern Counties Provincial Conference held at East Malling in July.

Four members of the staff attended a Conference on Strawberry Cultivation organized by the Ministry of Agriculture at Botley Experimental Station in June.

The Wye Provincial Conference was held at East Malling in April.

Exhibits.

In view of the large number of visitors expected to attend the 21st Anniversary celebrations on 24th May it was decided to stage a comprehensive set of special exhibits on that day to illustrate some of the most important features in the work of the Station. The preparation of over twenty exhibits on this occasion entailed considerable expense, and for that reason it was found necessary to curtail our show exhibit activities as much as possible in 1934.

At the Kent County Agricultural Show an exhibit was staged in conjunction with Wye College in illustration of our joint work on Fruit Soil Surveys in the county. At the Conference organized by the Royal Horticultural Society at the Crystal Palace in September, we put up a small exhibit in illustration of the paper contributed by the Director to the Conference on " Pear Rootstocks ". At the special request of the Imperial Fruit Show Committee and with the aid of a grant made by them for the purpose, for which our thanks are due, an exhibit illustrating the work of our strawberry team on " Strawberry Problems in Kent " was staged at the Imperial Fruit Show at Leicester in November. Small exhibits of fruit packed to National Mark standards were sent at the request of the Ministry of Agriculture to their marketing exhibits at the Kent County Show and at Marden Commercial Fruit Show.

We were glad to co-operate in the show of local varieties of apples at the R.H.S. Conference in September by sending specimens of several little-known varieties for exhibition at the Crystal Palace.

The Worshipful Company of Fruiterers were again good enough to honour us with a request for an exhibit of choice apples and pears to be sent to the banquet at the Mansion House for presentation to the Lord Mayor, and also for their St. Paul's Day Dinner in January.

Visitors.

Our Visitors' Book which, owing to the frailty of human nature can never be regarded as a complete record, nevertheless in 1934 showed a total of 2,229 visitors to the Station in the course of the year, representing an increase of 588 over the figure for 1933. Whilst this record number is no doubt largely due to the fact that we were celebrating our 21st Anniversary, it must also be remembered that our membership list increased by leaps and bounds as a result of the special membership campaign mentioned elsewhere

in this report, and this increase was undoubtedly reflected in the pages of our visitors' book.

Another record broken last year was the number of organized parties received at the Station which totalled forty-seven, representing an increase of eleven over last year. In this connection special mention should be made of the visit paid to the Station by the Imperial Mycological Conference in September to see the work of our plant pathologists in connection with virus and other diseases.

We were glad to welcome a party of thirty-four fruit growers from Essex in August, and as a sign of the interest taken in the Station by fruit growers on the Continent it is interesting to note that we received organized parties of visitors from the Rhone Valley, from other parts of Germany, from Normandy, Brittany and Denmark.

As reported elsewhere we received our first Royal Visitor in the person of His Royal Highness the Duke of York.

In conjunction with the Imperial Bureau of Fruit Production we have received 154 visitors from overseas coming from thirty different countries.

A successful innovation this year was the holding of an Open Day immediately before our Members' Day, to which all those in Maidstone and district who were interested were invited to come and see the Station. Over 300 visitors gratified us by their attendance on this occasion.

Kent Fruit Soil Survey.

We are happy to be able to announce that the results of the original survey of the Lower Greensand, undertaken by Gethin Jones of Wye College, and W. A. Bane of East Malling, was published in November 1934, as a Bulletin of the Ministry of Agriculture and Fisheries, obtainable either direct from the Ministry or from the Secretary, East Malling, price 3s. 3d., post free. In view of the very interesting correlation between soil type and tree growth we should like to urge that all fruit growers on the Lower Greensand should possess themselves of a copy.

We hope that the Ministry may see fit to publish a similar report on the Hastings Beds, undertaken by B. S. Furneaux of Wye College and Messrs. N. B. Bagenal and W. A. Bane of East Malling, which is now practically ready.

On several occasions the Station has made use of the valuable information which Mr. Furneaux's systematic soil studies has made available, and it is much to be regretted that similar investigations with soils on other geological formations in Kent in relation to tree performance have now come to a complete standstill.

Distribution of Rootstocks and Surplus Experimental Material.

As anticipated, last season has seen the distribution of considerable quantities of virus-free Lloyd George raspberry canes and Royal Sovereign strawberry plants, approximately 100,000 and 20,000 respectively. Over 30,000 clonal currants and gooseberries have also been distributed, 20,000 of these being the black currant Wellington XXX, the original plant of which was raised by the Research Station. It is expected that most of the foregoing will provide material for large-scale propagation.

The postponement of the planting of a large rootstock and manurial trial of pears on quince and selected vegetatively propagated "free" pear rootstocks, made possible the distribution of experimental sets of trees on varying soils throughout the country and to two centres overseas. In all about 5,000 trees, worked upon known rootstocks, were available for experimental purposes to our members, research institutes and

educational centres. Sixty-six schools received consignments of material for demonstration.

Of the 300,000 rootstocks distributed during the year, 70,000 were shipped overseas in some cases going as far afield as Australia, New Zealand, South Africa, Kenya, Palestine, India, Norfolk Island and Cyprus. Thus the establishment of this rootstock nursery under the auspices of the Empire Marketing Board has been amply justified. Almost all the European countries received small experimental consignments as did also Morocco and the Argentine. In many cases interesting material was received in exchange. It is gratifying to note that both nurserymen and experimenters are relying increasingly on the Station as a source of true rootstocks.

With the substantial increase in our membership, the work entailed in distribution has increased considerably, and the difficulties of arranging shipments overseas have not been lessened during the year by the imposition of restrictions on the movement of plants from one country to another.

As the demand for grafted walnut trees during the last few years has been much greater than the supply, arrangements have now been made for the Nursery trade to take over the propagation of walnuts on a commercial scale. Most of the young grafted trees that were available in 1934 were supplied to the firms that are taking up this work.

For financial reasons, the Walnut investigations at the Station have been limited to a few of the more important aspects, but an endeavour is being made to continue some propagation experiments with the clonal material which is now available.

Distribution of Fruit for Experimental Purposes.

As in previous years we continue to receive requests from investigators in other parts of the country for samples of fruit taken from our trees of known pedigree, and consignments for this purpose have been despatched to Long Ashton Research Station (Dr. T. Wallace), Imperial College of Science and Technology (Dr. A. S. Horne), Ditton Laboratory (Dr. C. West), Low Temperature Station (Dr. Fidler), Messrs. Bulmer & Co., Hereford (Mr. E. Ball) and The United Potash Company Ltd. (Mr. G. Cowie).

Herbarium Specimens.

The increased facilities now available for the storage of herbarium specimens in the E.M.B. building have made it possible not merely to keep the existing collections in a much better condition, but to make extensive additions from time to time.

Station's Publications.

Forty-seven Scientific papers and fifteen bulletins of a popular nature were published during the year, the titles and summaries of all these papers appear in the Annual Report. A complete list of available publications together with their price can be obtained on application to the Secretary.

The Journal of Pomology and Horticultural Science continues to be edited jointly with Professor Barker of Long Ashton—the actual executive work being carried on as heretofore at East Malling. Both Institutes continue to share the financial responsibility, which thanks to the careful attention to detail given by Miss L. E. Alexander is causing less anxiety.

LIBRARY.

The Library continues to be administered by the Library Committee in co-operation with the Imperial Bureau of Fruit Production which acts as Librarian.

We would express our gratitude to the late Mr. H. R. Beeton who continued to send us the *Journal of Heredity* until his death in June, and to Professor W. L. Howard of the University of California for the current numbers of *Science Journal*. We are indebted to the Secretary of the Royal Agricultural Society of England, for presenting the library with a number of early volumes of *The Journal of the Royal Agricultural Society of England* and also to Mr. C. T. Kingzett for Volumes I and II of the *Annals of Chemical Medicine* and a copy of *Nature's Hygiene and Sanitary Chemistry*.

Mrs. K. E. Emptage very kindly made a final presentation in May from the valuable collection of books belonging to the late Mr. W. F. Emptage.

Our thanks are also due to the Director and Mr. N. B. Bagenal for volumes presented to the Library.

Headley Brothers, 109 Kingsway, London, W.C.2; and Ashford, Kent.